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WILLIAM B. UMSTEAD STATE PARK AQUATIC INVENTORY

by
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edited by
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WILLIAM B. UMSTEAD STATE PARK
AQUATIC INVENTORY

Crabtree Creek near Reedy Creek Lake

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William B. Umstead State Park Aquatic Inventory

Introduction

William B. Umstead State Park is located in Wake County and encompasses 5,381 acres. The park is located in the Research Triangle area. It is divided into two separate sections: Crabtree Creek and Reedy Creek. These lands were purchased in the 1930s by the State to provide much needed jobs. The Crabtree Creek Recreational Area was purchased for only one dollar.

The Reedy Creek area encompasses approximately 1,000 acres. In 1950, it was established as a park for African Americans, known as Reedy Creek State Park. In 1966, Crabtree Creek and Reedy Creek were united under the same name, William B. Umstead State Park and it was open to all people.

Before the lands were purchased by the State, they were used for agriculture. Poor agricultural practices depleted the soil within this area. Today, the forests are slowly being restored.

Crabtree Creek is the main Neuse River tributary running through the park. The purpose of this project was to survey for aquatic species, including crayfish, fish, snails, mussels, and sphaeriid clams. Our inventory included the main waterway of the park as well as significant tributaries. Crabtree Creek was surveyed upstream, within, and downstream of the park. Figure 1 details the localities of all stations surveyed. The following sections provide information on the species in the above taxa documented at each site in the Crabtree Creek Subbasin.

Acknowledgments

The completion of this project would not have been possible without the invaluable assistance of the following people: William F. Adams, J. Eric Alderman, John M. Alderman, Alvin Braswell, Allen Boynton, Mike B. Carraway, John E. Cooper, Mark A. Hartman, Tom Henson, Merrill Lynch, Gerald L. Mackie, Chris McGrath, Lawrence M. Page, William M. Palmer, Tim Savidge, Danny Smith, Kenneth R. Taylor, Fred G. Thompson, and Randall C. Wilson. We also thank the state park staff and the landowners who allowed us to work on their properties.

Gabriela B. Mottesi

CRABTREE CREEK SUBBASIN

STATIONS INVENTORIED

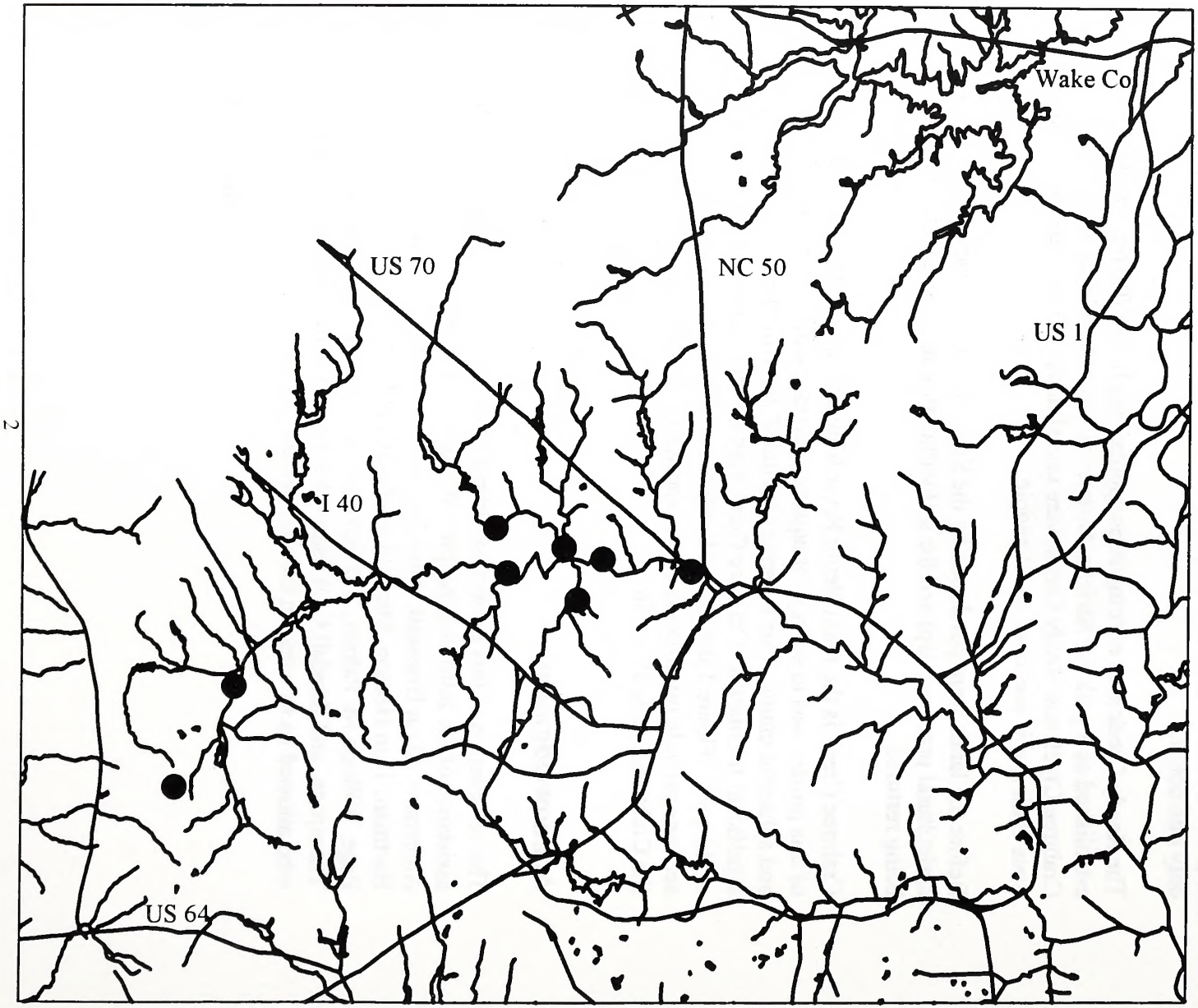
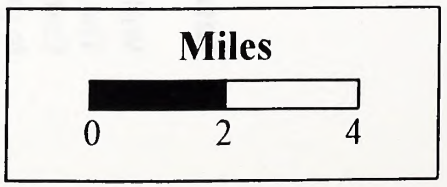


Figure 1.



Aquatic Snails

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Introduction

There are approximately 500 species of aquatic snails currently recognized in North America. These 500 species are divided into 78 genera and 15 families (Burch 1989). In North Carolina, there are approximately 52 species representing 8 families (Adams 1990).

Snails are grouped into one of two subclasses. Prosobranch snails are gill-breathing and have an operculum, which is a calcareous plate that closes the aperture when the snail withdraws into its shell. Pulmonate snails are lung-breathing and do not have an operculum to seal their aperture (Burch 1989).

These animals graze on algae and other microscopic organisms using radular teeth to grind food to an appropriate size for consumption. Snails are an essential part of aquatic ecosystems, in addition to being indicators of water quality. However, they are typically overlooked. The lack of information and knowledge of snails can be attributed, in part, to their minute size, perceived lack of activity, cryptic habits, and difficulty in identification.

Methods

Study areas for this project included certain aquatic habitats associated with Crabtree Creek and its tributaries (Fig. 1, Introduction Section). Most habitats can be described as riffle/run with medium to fast flows or small to medium-sized pools with low flows. Substrate included various combinations of silt, sand, gravel, cobble, and boulder. Some aquatic vegetation and organic debris were also present.

Specimens were collected using visual and tactile searches. Due to the cryptic habits of some snail species, it was necessary to sift and dredge the substrate. Snails were collected at bridge crossings, and all habitats were sampled.

Snails were preserved and stored in 70% ethanol. Snails and limpet snails were identified by using Burch (1989) and Basch (1963). Verifications of a subset of specimen identifications were made by Dr. Fred G. Thompson. Expected distributions and the following characteristics were used to identify the specimens: presence/absence of an operculum, direction of coiling, shell size and shape, texture of the shell, and shape and

number of the whorls. With the acquisition of more information, identifications may be subject to change.

Results and Discussion

Snails were located at four of the sites surveyed (Fig. 1). Seven species of snails representing six families and both subclasses were found within the Crabtree Creek Subbasin (Table 1).

Nearly 50 years ago, Walderman M. Walter completed a survey of the mollusks of the Upper Neuse River Basin (Walter 1954). He found the following snail species within the Crabtree Creek Subbasin: *Campeloma decisum* (Say, 1817), *Leptoxis (Mudalia) carinata*, *Elimia catenaria*, *Pseudosuccinea columella*, *Helisoma anceps*, *Menetus dilatatus* (Gould, 1841), *Ferrisia hendersoni* (Walker, 1908), and *Laevapex diaphanus* (Haldeman, 1841). James R. Flowers and Grover C. Miller found all of the above listed species in a survey of the Neuse River Basin except for *Ferrisia hendersoni* and *Laevapex diaphanus* (Flowers and Miller 1993). Flowers and Miller also found new records of *Ferrisia fragilis* (Tryon, 1863) and *Laevapex fuscus* within the Neuse River Basin.

Snail species diversity and abundance appear to be moderate in the Crabtree Creek Subbasin (Table 1). We were not able to find some of the species found in previous surveys. Also, some species were only collected at one site and in low numbers (Table 2). This does not necessarily indicate low abundance or limited distributions of these species. Fluctuations in water level, as well as turbidity, can negatively affect collection success.

The mimic lymnaea (*Pseudosuccinea columella)* was found attached to rocks in the faster current. Also on the rocks were the gravel elimia (*Elimia catenaria*), and the crested mudalia (*Leptoxis (Mudalia) carinata*). The limpet snail (*Laevapex fuscus*) was located on the underside of large cobble in the faster current.

The two-ridge rams-horn (*Helisoma anceps*), and *Physella* sp. were found in the backwater areas with low flow. Both of these species thrive in mud/silt substrate. The buffalo pebblesnail (*Gillia altilis*), was collected around and within the aquatic vegetation.

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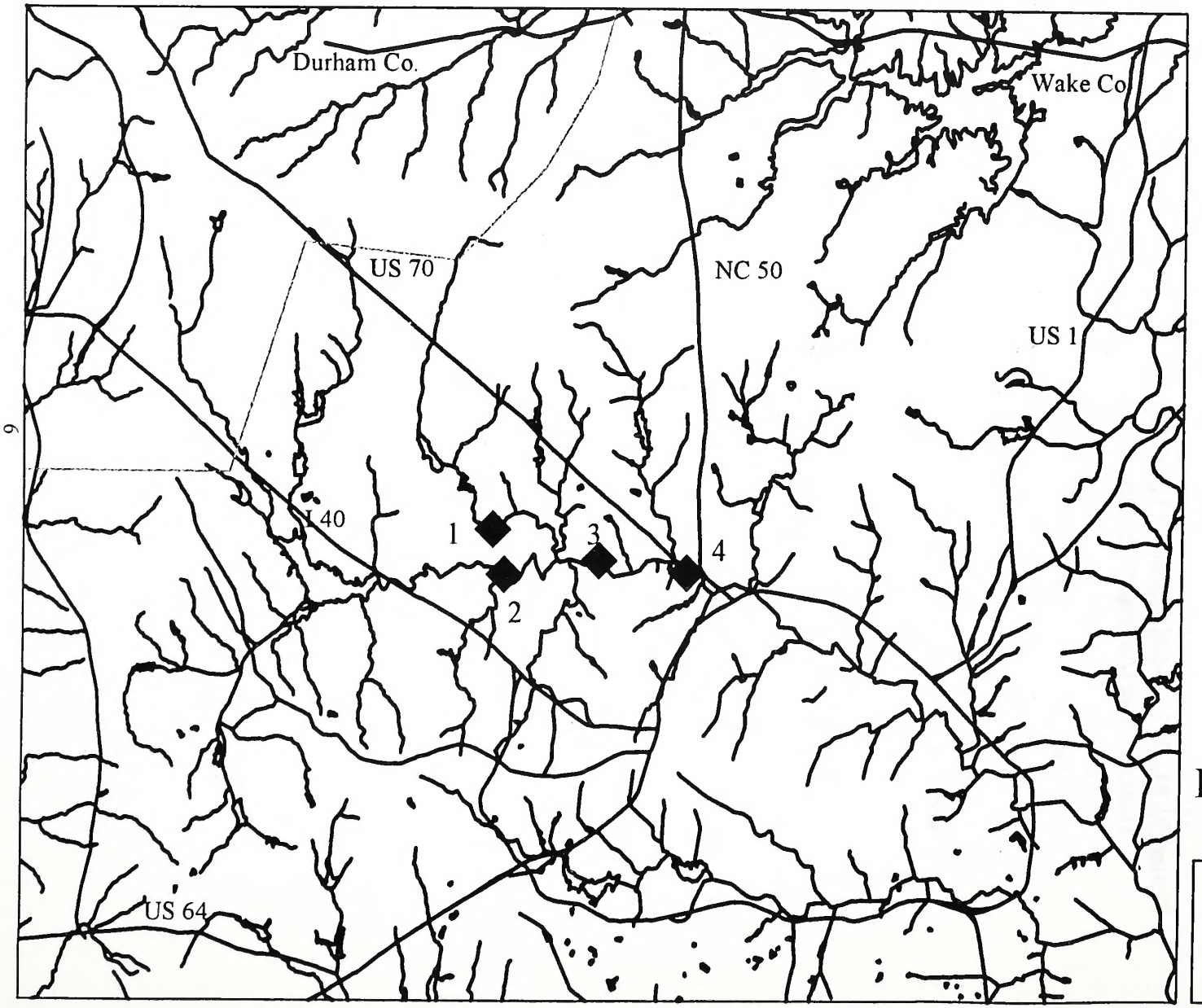
CRABTREE CREEK SUBBASIN
AQUATIC SNAIL SPECIES INVENTORY



Legend

Dot No.	Station No.
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2	951003.1
3	950921.2
4	950921.1

Figure 1.

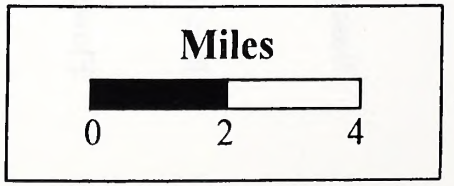

Table 1. Snails found in the Crabtree Creek Subbasin

Prosobranchia	
Hydrobiidae	
Gillia altilis (I. Lea, 1841)	Buffalo pebblesnail
Pleuroceridae	
Elimia catenaria (Say, 1822)	Gravel elimia
Leptoxis (Mudalia) carinata (Bruguière, 1792)	Crested mudalia
Pulmonata	
Lymnaeidae	
Pseudosuccinea columella (Say, 1817)	Mimic lymnaea
Physidae	
Physella sp.	
Planorbidae	
Helisoma anceps (Menke, 1830)	Two-ridge rams-horn
Ancylidae	
Laevapex fuscus (C. B. Adams, 1841)	Dusky ancylid

Table 2. Snails found in Crabtree Creek Subbasin

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
950921.1	*Leptoxis (Mudalia) carinata*	Crested mudalia	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	20	G.B. Mottesi
950921.1	*Elimia catenaria*	Gravel elimia	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	39	G.B. Mottesi
950921.2	*Helisoma anceps*	Two-ridge rams-horn	Crabtree Creek	Ouraleigh Road	Wake Co., NC	21 September 1995	22	G.B. Mottesi
950921.2	*Elimia catenaria*	Gravel elimia	Crabtree Creek	Ouraleigh Road	Wake Co., NC	21 September 1995	17	G.B. Mottesi
950921.2	*Physella sp.*	---	Crabtree Creek	Ouraleigh Road	Wake Co., NC	21 September 1995	25	G.B. Mottesi
950921.2	*Pseudosuccinea columella*	Mimic lymnaea	Crabtree Creek	Ouraleigh Road	Wake Co., NC	21 September 1995	3	G.B. Mottesi
951003.1	*Gillia altilis*	Buffalo pebblesnail	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	2	F.G. Thompson, G.B. Mottesi
951003.1	*Elimia catenaria*	Gravel elimia	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	12	G.B. Mottesi
951003.1	*Helisoma anceps*	Two-ridge rams-horn	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	6	G.B. Mottesi
951003.1	*Physella sp.*	---	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	9	G.B. Mottesi
951003.1	*Pseudosuccinea columella*	Mimic lymnaea	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	4	G.B. Mottesi
960429.1	*Laevapex fuscus*	Dusky ancylid	Sycamore Creek	Umstead Park, off of bike trail	Wake Co., NC	29 April 1996	1	G.B. Mottesi
960604.2	*Helisoma anceps*	Two-ridge rams-horn	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	4 June 1996	1	G.B. Mottesi
960604.2	*Physella sp.*		Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	4 June 1996	5	G.B. Mottesi
960604.2	*Laevapex fuscus*	Ousky ancylid	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	4 June 1996	10	G.B. Mottesi

Freshwater Mussels and Sphaeriid Clams

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NC Wildlife Resources Commission

Introduction

Freshwater mussels are in the Class Bivalvia. As the name implies, the mussel is separated into right and left shell-secreting centers. The shell itself is a single entity which is divided into right and left portions. Mussels are characterized by having greatly enlarged gills with ciliated filaments for filter feeding. Freshwater mussels are integral parts of many aquatic ecosystems. They provide nutrients for insects and other invertebrates and are a food source for other organisms. Because they are filter feeders, they are excellent indicators of water quality.

There are approximately 300 species and subspecies of freshwater mussels in the United States. The greatest diversity of these mussels occurs in the Southeast. Roughly 70 species can be found in North Carolina. Unfortunately, approximately half are state listed as Endangered, Threatened, or species of Special Concern (Adams 1990). It appears that the mussel fauna of the United States is in danger of extinction (Williams, et al. 1992). Therefore, it is necessary that we determine the status and distribution of these organisms so that proper management techniques can be applied.

Sphaeriid clams, like freshwater mussels, are in the Class Bivalvia and are filter feeders. The members of this family are considered the pea, pill, nut, or fingernail clams. Because of their well-developed mechanism of passive dispersal and adaptability, sphaeriid clams can be found in almost any body of freshwater. Therefore, their distributions are considered truly cosmopolitan (Branson 1988). In spite of their cosmopolitan distribution, not much is known about sphaeriid clams. They are represented in North America by 38 species of the family Sphaeriidae. In North Carolina, there are approximately 13 species of sphaeriid clams (Adams 1990).

One exotic species, the Asian clam (*Corbicula fluminea* (Müller 1774)), of the family Corbiculidae (Burch 1975) was introduced into this country in 1937 and was found throughout the entire area surveyed.

Methods

Study areas for this project included certain aquatic habitats associated with Crabtree Creek and its tributaries (Fig. 1, Introduction Section). Most habitats can be described as riffle/run with medium to fast flows or small to medium-sized pools with low flows.

Substrate included various combinations of silt, sand, gravel, cobble, and boulder. Some aquatic vegetation and organic debris were also present.

Freshwater mussels were collected at bridge crossings throughout the Crabtree Creek Subbasin. Various techniques were used including snorkeling, sifting of the substrate, visual and tactile searches, and visual searches of the shores for shells. Live mussels were identified, measured, and returned unharmed to the appropriate habitats. Fresh shells were identified, measured, and kept for curation.

Sphaeriid clams were also collected at bridge crossings throughout the Crabtree Creek Subbasin. Collecting techniques included seining, dip netting, sifting of the substrate, and visual and tactile searches. Specimens were preserved and stored in 70% ethanol. Sphaeriid clams were identified using Branson (1988) and Burch (1975). Verification of a subset of identifications was made by Dr. Gerald M. Mackie. With additional information, identifications made of both freshwater mussels and sphaeriid clams may be subject to change.

Results and Discussion

Figure 1 shows the stations where freshwater mussels were found. At least six species of mussels, all in the family Unionidae, were found in the Crabtree Creek Subbasin (Table 1). Both the *Elliptio complanata* complex and *Elliptio icterina* complex occur in the Crabtree Creek Subbasin.

One sphaeriid clam species was found in the Crabtree Creek Subbasin (Figure 2, Table 3).

In 1994, Arthur E. Bogan completed a survey of Crabtree Creek and found live specimens of the following species: lanceolate elliptio, *Elliptio complanata* (Lightfoot, 1786), *Elliptio icterina* (Conrad, 1834), and *Fusconaia masoni*. He found only shells of the following species: *Pyganodon cataracta* (Say, 1817), *Strophitus undulatus*, and *Villosa constricta*.

We did not find all of the species which Bogan (1994) found, but we did find a fresh shell of *Alasmidonta undulata*, which he did not find (Table 2). The specimens falling into either the *Elliptio complanata* or *Elliptio icterina* complexes were listed under the *Elliptio* spp. category. Therefore, these complexes possibly contain several species. The ecophenotypes of these *Elliptio* complexes are found at numerous sites throughout eastern North Carolina (Alderman, pers. comm., 1996).

Diversity and abundance of mussels are medium to low throughout the Crabtree Creek Subbasin. Many factors could possibly be affecting mussel populations in the creek, the main ones being nonpoint pollution associated with rapid development near the creek and toxicants from the numerous point sources discharging to the creek. Because of current

population statuses and expanding sources of pollution, none of the state listed or significantly rare mussel species should be considered secure within the Crabtree Creek Subbasin.

The striated fingernailclam (*Sphaerium striatinum* (Lamarck, 1818)) was found within the cobble substrate at one station. Siltation and other forms of pollution could be the reason why sphaeriid clams were not prevalent at other survey stations.

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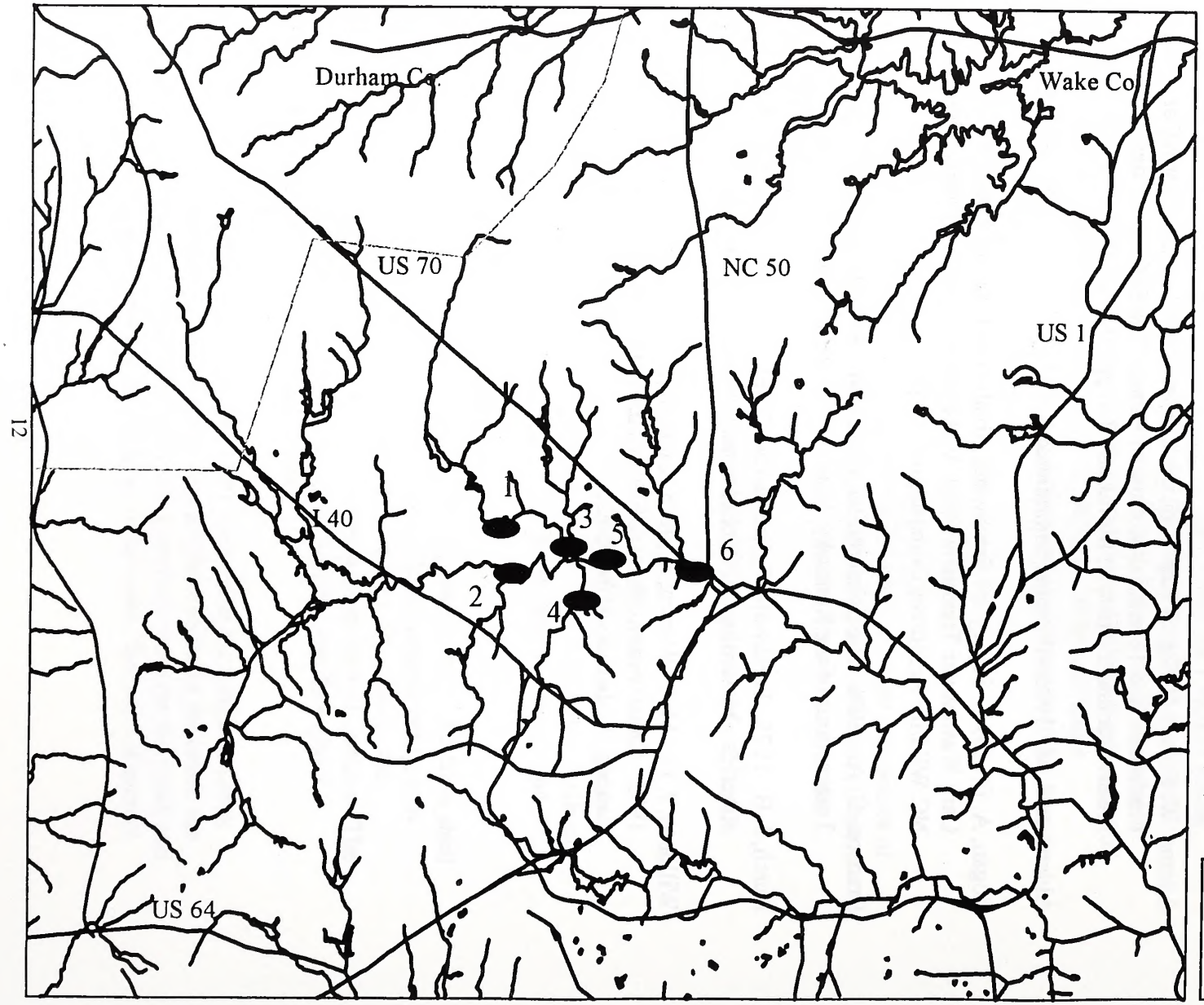
CRABTREE CREEK SUBBASIN

FRESHWATER MUSSEL SPECIES INVENTORY



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4	950920.2
5	950921.2
6	950921.1

Figure 1.

Miles

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CRABTREE CREEK SUBBASIN
SPHAERIID CLAM SPECIES INVENTORY

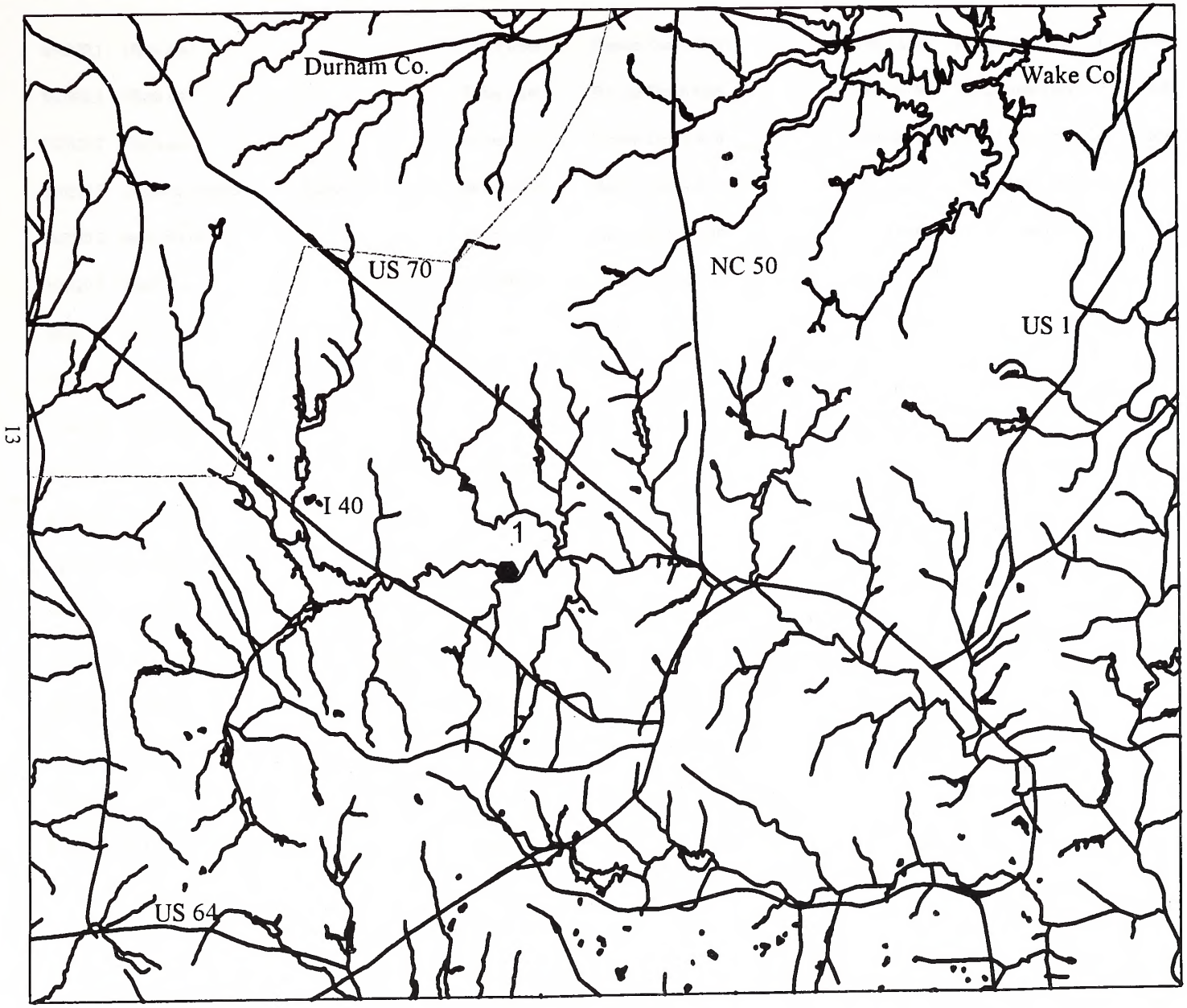

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Figure 2.

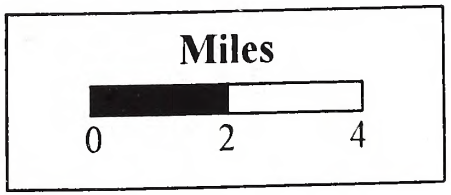

Table 1. Freshwater mussels found in the Crabtree Creek Subbasin

Unionidae	
Alasmidonta undulata (Say, 1817)	Triangle floater
Elliptio spp.	
Fusconaia masoni (Conrad, 1834)	Atlantic pigtoe
lanceolate elliptio	
Strophitus undulatus (Say, 1817)	Squawfoot
Villosa constricta (Conrad, 1838)	Notched rainbow

Table 2. Mussels found in the Crabtree Creek Subbasin

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Type	Max L (mm)	Min L (mm)	Mean L (mm)	StDev
950920.1	*Elliptio spp.*	---	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	1	Live	80	80	80	0
950920.1	*Elliptio spp.*	---	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	1	Shell	---	---	---	---
950920.2	*Elliptio spp.*	---	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	34	Shell	---	---	---	---
950920.2	*Strophitus undulatus*	Squawfoot	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	1	Shell	---	---	---	---
950920.2	*lanceolate elliptio*	---	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	3	Shell	---	---	---	---
950920.2	*Elliptio spp.*	---	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	19	Live	98	67	83.53	7.81
950921.1	*Elliptio spp.*	---	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	2	Shell	---	---	---	---
950921.2	*Strophitus undulatus*	Squawfoot	Crabtree Creek	Duraleigh Road	Wake Co., NC	21 September 1995	1	Shell	---	---	---	---
950921.2	*Elliptio spp.*	---	Crabtree Creek	Duraleigh Road	Wake Co., NC	21 September 1995	7	Shell	---	---	---	---
950921.2	*Alasmidonta undulata*	Triangle floater	Crabtree Creek	Duraleigh Road	Wake Co., NC	21 September 1995	1	Shell	---	---	---	---
951003.1	*Elliptio spp.*	---	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	81	Shell	---	---	---	---
951003.1	*Fusconaia masoni*	Atlantic pigtoe	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	1	Shell	---	---	---	---
951003.1	*Strophitus undulatus*	Squawfoot	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	3	Shell	---	---	---	---
951003.1	*Villosa constricta*	Notched rainbow	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	1	Shell	---	---	---	---
960429.1	*Elliptio spp.*		Sycamore Creek	State Park off Ebenezer Ch. Rd.	Wake Co., NC	29 April 1996	4	Shell	101	69	83.00	15.58
960429.1	*Elliptio spp.*		Sycamore Creek	State Park off Ebenezer Ch. Rd.	Wake Co., NC	29 April 1996	19	Live	103	59	80.26	11.06
960604.2	*Elliptio spp.*		Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	4 June 1996	40	Live	84	51	60.53	7.86
960604.2	*Fusconaia masoni*	Atlantic pigtoe	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	4 June 1996	1	Live	62	62	62	---

Table 3. Sphaeriid clams found in the Crabtree Creek Subbasin

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Type	Identified By
951003.1	*Sphaerium striatinum*	Striated fingernailclam	Crabtree Creek	Umstead Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	1	Shell	G.B. Mottesi

Crayfish

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NC Wildlife Resources Commission

Introduction

Some of the most common freshwater organisms in the Order Decapoda are crayfish. In the United States and Canada, there are currently 338 recognized taxa of crayfish. The greatest diversity of these species reside in the southeastern region of the United States (Taylor et al. 1996). In North Carolina alone, there are 29 described species and several species complexes (Cooper and Braswell 1995). In addition, there are several undescribed species that have not been officially recognized (Cooper, pers. comm., 1995). Of the 29 crayfish species found in North Carolina, one is endemic (McGrath 1994), and twelve others are listed as significantly rare by the North Carolina Natural Heritage Program (LeGrand and Hall 1995).

Being largely nocturnal aquatic species, crayfish forage mostly at night and usually seek shelter from predators during daylight hours. They are gill breathing organisms that absorb oxygen from the water. Crayfish are classified as either non-burrowers or burrowers. Non-burrowing crayfish spend their entire life in the stream bed. Burrowing crayfish excavate tunnels in roadside ditches, wet pastures, and floodplains (Taylor et al. 1996). Depending on the species, burrowing crayfish spend different amounts of their life cycle underground. Primary burrowers spend the majority of their time in burrows that extend downward to the water table (McGrath 1994). Secondary burrowers also inhabit burrows, but they venture to the surface during heavy flooding periods. Tertiary burrowers retreat to burrows only during periods of extreme drought (Hobbs 1989).

The average life span of a crayfish is between two and three years (Taylor et al. 1996). During this time, they grow through a series of molts of their exoskeleton. They have five pairs of abdominal appendages called pleopods. The first pleopod pair of the male is modified as a sexual organ. In the family Cambaridae (which includes all North Carolina species), there are two designations for adult male crayfish: Form I and Form II. Form I males are able to sexually reproduce and Form II males are not. Both forms are morphologically similar except in the texture and shape of the first pleopod. Throughout their lives, adult males cycle between Form I and Form II. Unlike adult males, adult females do not cycle between morphological forms. Once they reach adulthood, they can sexually reproduce. During the mating season, they develop mature ova which can be seen under the posterior edge of the carapace (Boyd and Page 1978).

Crayfish play a significant role in the delicate balance of aquatic life. They consume detritus and other dead material and are subsequently consumed by larger aquatic predators such as fish, birds, and mammals. While other feeding relationships can also transfer nutrients from the detritus to the larger species, these relationships often require multiple steps. The direct food chain from detritus to crayfish to predator simplifies nutrient transfer and minimizes energy loss (Crocker and Barr 1968).

Although crayfish are common in many freshwater ecosystems, there are significant gaps in our understanding of the distribution and biology of many species. A recent report on the "Conservation Status of Crayfishes of the United States and Canada" estimated that in the United States and Canada 50% of the crayfish species are "in need of conservation recognition" (Taylor et. al. 1996).

The current project is a contribution to the ongoing collection of crayfish data. This survey focused on the crayfish which occur within North Carolina state park waterways and their surrounding tributaries. Since the emphasis of the project was on the inhabitants of the surface water, most of the crayfish collected were non-burrowers. Due to time and weather restrictions, the exact distribution of each species within the state park and its associated waterways was not determined. An estimation was made for the relative abundance of each species collected. In addition, specific habitat preferences for each species were noted.

Methods

Crayfish were surveyed for at bridge crossings of Crabtree Creek and its tributaries. Species were collected with a dip net and a 6' X 10' mesh net seine. Collected specimens were preserved and stored in 70% ethanol.

A variety of resources were consulted for identification. "An Illustrated Checklist of the American Crayfishes" (Hobbs 1989) was particularly helpful as well as an unpublished key of North Carolina crayfish (Hobbs 1991). Dr. John Cooper, North Carolina State Museum of Natural Sciences, verified the identification of select specimens and provided additional information used for identification. With additional information, the identifications may be subject to change.

The specific morphology and structure of the first pleopod pair of the Form I male is the key feature used to differentiate crayfish species from one another. Once a particular species is identified based on the pleopod, other characteristics can be used to recognize female and non-form I males. These characteristics include carapace, chelae, and rostrum shape and body coloration.

The carapace is the protective exoskeleton plate which encompasses the anterior half of the crayfish body. It can be deep (dorsoventrally) and narrow (laterally) or flat and wide. Some carapaces are spinose and others are smooth. The chelae are enlarged claws on the

first pair of legs. They can be long and narrow or round and full; some have setae (hair) and others do not. The rostrum refers to the anterior most portion of the carapace, and it can be spinose or smooth. In terms of coloration, the exoskeleton can be plain, marbled, or striped with shades of blue, brown, tan, olive, and red.

Specimens were organized into three categories: Form I male, non-form I male, and female (Table 1). Non-form I males were not sorted into juvenile and Form II males, because it is nearly impossible to distinguish large juvenile males from small Form II males (Page, pers. comm., 1995). Additional information on the age of the collected specimens is provided by the range in carapace length (Table 1). Carapace length is measured from the tip of the rostrum to the posterior carapace edge (anterior abdomen) (Page 1985).

Results

Depending on the substrate and habitat at each site, different techniques were effective for collection. Crayfish were spotted by inspecting the substrate under large cobble and boulders. In small streams, an effective spotting method was to disturb the substrate with a few noisy steps and wait for crayfish to emerge. A dip net was most effective for trapping crayfish under large cobble and boulders along shorelines of the river and in small, shallow tributaries. The seine was used for larger tributaries and the river bottom. Kicking into the seine over a riffle and walking the seine through pool areas proved effective. Walking the seine through leaf mats on the stream bottom often yielded juvenile crayfish.

Collections were made on 9 days between 19 September 1995 and 4 June 1996 from 8 sites (Fig. 1, Introduction Section). Crayfish were collected or observed at 6 sites (Fig. 1). Some sites were visited more than once. Two species of crayfish were collected: *Cambarus (Puncticambarus) "acuminatus"* (Faxon, 1884), and *Cambarus (Depressicambarus) latimanus* (LeConte, 1856).

Cambarus (P.) "acuminatus" was most commonly found in cobble associated with riffle/run habitats. Other habitats included cobble at the edges of Crabtree Creek and under root mats along the shoreline . Eight non-form I males and 13 females were collected. Carapace length ranged from 14.9 to 33.0 mm; mean length was 20.6 mm. No Form I males were found, but non-form I males were collected between 20 September 1995 and 4 June 1996 (Table 1).

Cambarus (D.) latimanus was most often collected from pool areas with cobble substrate. One non-form I male and 4 females were collected. Carapace length ranged from 18.8 to 26.6 mm; mean length was 23.6 mm. Some juvenile females were also observed, but a measurement was not taken. No form I males were found, but non-form I males were collected between 3 October 1995 and 4 June 1996 (Table 1).

Discussion

There is a fair abundance and diversity of crayfish in the Crabtree Creek Subbasin. *Cambarus (P.) "acuminatus"* and *Cambarus (D.) latimanus* were common in some areas and not common in others. Within the state park boundaries, these two species are readily found. However, in the tributaries to Crabtree Creek, which lie just outside the park boundary, it was difficult to find habitats which supported crayfish. Turkey Creek and Richland Creek were the only two tributaries with detectable crayfish populations.

The low number of *C. (D.) latimanus* specimens collected is not necessarily unusual. This species is a secondary burrower (Hobbs 1989) which frequents the surface water only on occasion. The low abundance of *C. (P.) "acuminatus"* specimens collected, however, was unusual. This species is widely distributed in North Carolina and has been quite abundant in other state parks surveyed (Eno River State Park, Medoc Mountain State Park). Taxonomically, the *C. (P.) "acuminatus"* specimens collected from the Crabtree Creek Subbasin are part of the species complex, *Cambarus* sp. C, which occurs across the Mountain, Piedmont, and Coastal Plain regions of the state. This complex needs further clarification (Cooper & Braswell 1995).

As indicated in the introduction to this section, the present survey concentrated on species found in the waterways of William B. Umstead State Park and its surrounding tributaries. This list of crayfish may not reflect all the crayfish in the park. Some burrowers are found in wetland habitats such as the floodplains surrounding the main waterway. Unfortunately, time did not allow for the survey of these additional areas.

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CRABTREE CREEK SUBBASIN

CRAYFISH SPECIES INVENTORY

Legend

Dot No.	Station No.
1	960429.1
2	951003.1 and 960604.2
3	950920.1
4	950920.2
5	950921.2
6	950921.1

Figure 1.

Miles

0 2 4

Table 1. Crayfish found in the Crabtree Creek Subbasin

Station No.	Scientific Name	Waterway	Locality	County	Date	Form I Male	Nonform I Male	Female	Identified By
950920.1	*C. (P.) "acuminatus"*	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	n/a	01: Min. 19.80 : Max. 19.80	03: Min. 15.30 : Max. 18.30	M.E. Savacool
950920.1	*C. (D.) latimanus*	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	n/a	n/a	01: Min. 24.40 : Max. 24.40	J.E. Cooper, M.E. Savacool
950920.2	*C. (P.) "acuminatus"*	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	n/a	01: Min. 19.40 : Max. 19.40	01: Min. 15.75 : Max. 15.75	M.E. Savacool
950921.1	*C. (P.) "acuminatus"*	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	n/a	n/a	01; Min. 20.60 : Max. 20.60	M.E. Savacool
950921.2	*C. (P.) "acuminatus"*	Crabtree Creek	Ouraleigh Road	Wake Co., NC	21 September 1995	n/a	01: Min. 20.15 : Max. 20.15	01; Min. 21.85 : Max. 21.85	M.E. Savacool
951003.1	*C. (D.) latimanus*	Crabtree Creek	Umstead Park, near Reedy Cr. Lake	Wake Co., NC	3 October 1995	n/a	01: Min. 25.40 : Max. 25.40	01: Min. 26.60 : Max. 26.60	J.E. Cooper, M.E. Savacool
951003.1	*C. (P.) "acuminatus"*	Crabtree Creek	Umstead Park, near Reedy Cr. Lake	Wake Co., NC	3 October 1995	n/a	04: Min. 14.85 : Max. 22.25	06: Min. 18.50 : Max. 33.00	J.E. Cooper, M.E. Savacool
960429.1	*C. (P.) "acuminatus"*	Sycamore Creek	Umstead Park, off bike trail	Wake Co., NC	29 April 1996	n/a	01: observed	01: observed	M.E. Savacool
960429.1	*C. (D.) latimanus*	Sycamore Creek	Umstead Park, off bike trail	Wake Co., NC	29 April 1996	n/a	n/a	02: observed	M.E. Savacool
960604.2	*C. (P.) "acuminatus"*	Crabtree Creek	Umstead Park, near Reedy Cr. Lake	Wake Co., NC	4 June 1996	n/a	01: Min. 31.45 : Max. 31.45	n/a	M.E. Savacool
960604.2	*C. (D.) latimanus*	Crabtree Creek	Umstead Park, near Reedy Cr. Lake	Wake Co., NC	4 June 1996	n/a	n/a	02: Min. 18.75 : Max. 22.75	M.E. Savacool

Freshwater Fishes

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NC Wildlife Resources Commission

Introduction

Approximately 790 fish species are believed to occur in the freshwaters of the United States and Canada (Page & Burr 1991). More than 225 species can be found in North Carolina (Menhinick 1991). This unusually rich and variable fish fauna is due to a great diversity of habitats found within the state and to different zoogeographic distribution patterns of various species. Many game species, several bait and forage species, and at least one aquarium species have become established in North Carolina waters (Menhinick 1991).

Unfortunately, almost one quarter of the fish occurring in North Carolina are state listed as Endangered, Threatened, or Special Concern species. This is of concern because fish are important components of aquatic ecosystems; they are indicators of water quality; and many species are a source of recreation for the state's citizens. Therefore, it is important that we determine their status/distributions and apply proper conservation techniques where necessary.

Methods

Study areas for this project included certain aquatic habitats associated with Crabtree Creek and its tributaries (Fig. 1, Introduction Section). Most habitats can be described as riffle/run with medium to fast flows or small to medium-sized pools with low flows. Substrate included various combinations of silt, sand, gravel, cobble, and boulder. Some aquatic vegetation and organic debris were also present.

Fish were collected at bridge crossings of Crabtree Creek and its tributaries. Collecting techniques included the use of a 6' x 10' minnow seine, dip nets, and minnow traps. Varying techniques of seining, such as kicking, setting and dragging, were necessary due to the diversity of habitats. Specimens were fixed in 10% formalin and preserved in 70% ethanol. Specimens not collected were returned unharmed.

The following sources were used as identification tools: Jenkins (1995), Menhinick (1991), Page (1983), and Page & Burr (1991). Some identifications were verified using specimens from the collection of the N.C. State Museum of Natural Sciences. With the acquisition of more information, identifications may be subject to change.

Results and Discussion

Six sites were sampled within five days (Fig. 1). Nineteen species of fish representing seven families were found within the Crabtree Creek Subbasin (Table 1).

The Crabtree Creek Subbasin contains a fair diversity and abundance of fish species. As is shown in Table 2, most species were collected in fair numbers at each site. The low diversity of habitats of this subbasin does not allow for a great diversity of species with varying habitat requirements. No Endangered, Threatened, or species of Special Concern were found within the Crabtree Creek Subbasin.

The darters were found in the riffle/run areas with fast flows. The johnny darter (*Etheostoma nigrum*) was also detected in small pools. The riffle/run and small pool areas also provided niches for the cyprinids and the northern hogsucker (*Hypentelium nigricans*).

Adult centrarchids were collected from the larger pools and, on occasion, in the faster current runs. Juvenile sunfish were found near root mats in the riffle/run and small pool areas.

The margined madtom (*Noturus insignis*), was collected in areas just beneath the faster riffle/runs where some aquatic vegetation and debris were observed.

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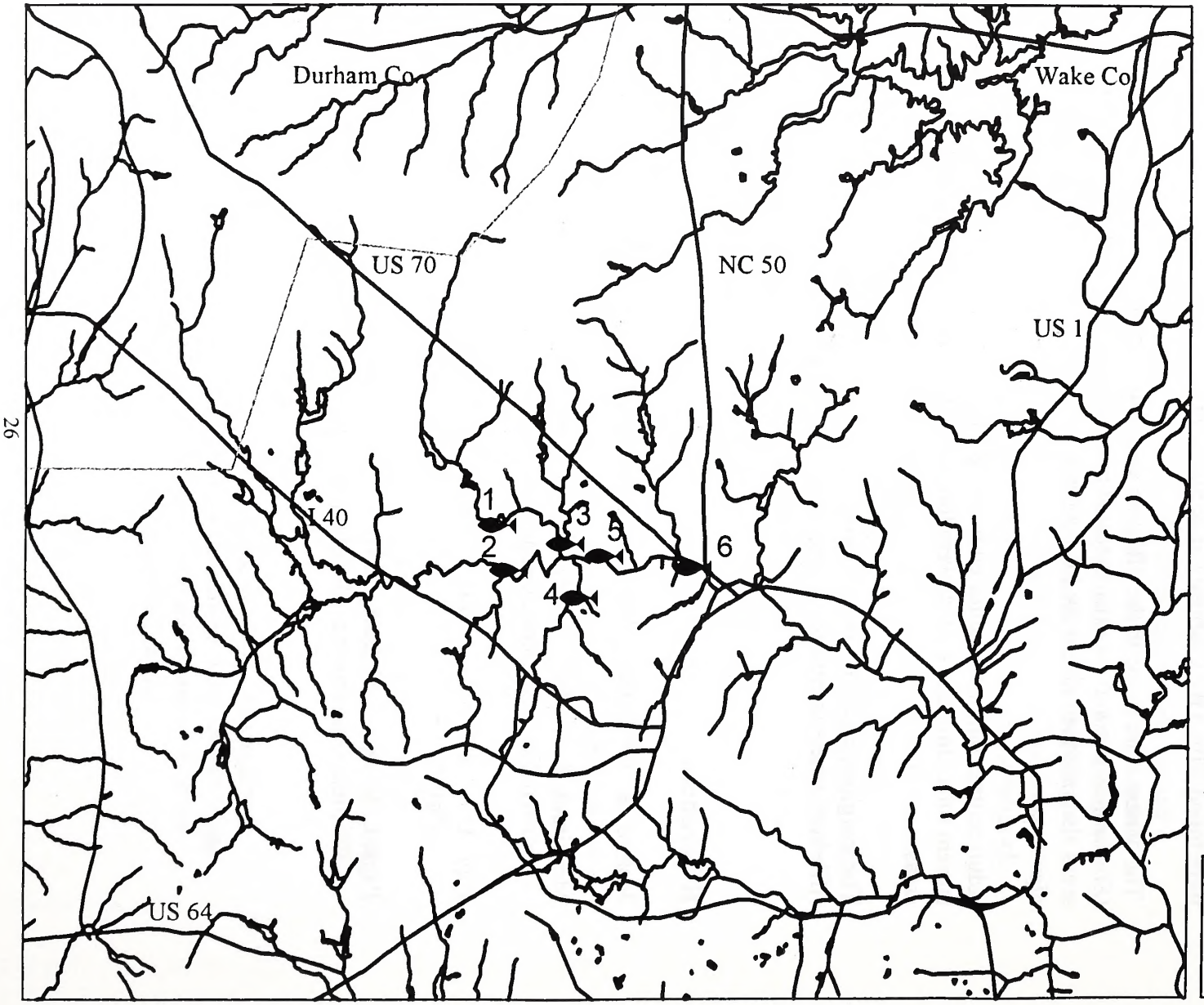
CRABTREE CREEK SUBBASIN

FISH SPECIES INVENTORY



Legend

Dot No.	Station No.
1	960429.1
2	951003.1 and 960604.2
3	950920.1
4	950920.2
5	950921.2
6	950921.1

Figure 1.

Miles

0 2 4

Table 1. Fish found in the Crabtree Creek Subbasin

Anguillidae	
Anguilla rostrata (Lesueur, 1817)	American eel
Cyprinidae	
Cyprinella analostana Girard, 1859	Satinfin shiner
Luxilus albeolus (Jordan, 1889)	White shiner
Lythrurus ardens (Cope, 1868)	Rosefin shiner
Nocomis leptocephalus (Girard, 1856)	Bluehead chub
Notropis procne (Cope, 1865)	Swallowtail shiner
Catostomidae	
Hypentelium nigricans (Lesueur, 1817)	Northern hog sucker
Ictaluridae	
Noturus insignis (Richardson, 1836)	Margined madtom
Poeciliidae	
Gambusia affinis (Baird & Girard, 1853)	Mosquitofish
Centrarchidae	
Lepomis auritus (Linnaeus, 1758)	Redbreast sunfish
Lepomis cyanellus Rafinesque, 1819	Green sunfish
Lepomis gibbosus (Linnaeus, 1758)	Pumpkinseed sunfish
Lepomis macrochirus Rafinesque, 1819	Bluegill
Lepomis microlophus (Günther, 1859)	Redear sunfish
Micropterus salmoides (Lacepède, 1802)	Largemouth bass
Pomoxis nigromaculatus (Lesueur, 1829)	Black crappie
Percidae	
Etheostoma flabellare Rafinesque, 1819	Fantail darter
Etheostoma nigrum Rafinesque, 1820	Johnny darter
Percina roanoka (Jordan & Jenkins, 1889)	Roanoke darter

Table 2. Fish found in the Crabtree Creek Subbasin

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
950920.1	*Etheostoma nigrum*	Johnny darter	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	4	G.B. Mottesi
950920.1	*Pomoxis nigromaculatus*	Black crappie	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	3	G.B. Mottesi
950920.1	*Luxilus albeolus*	White shiner	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	5	G.B. Mottesi
950920.1	*Notropis procne*	Swallowtail shiner	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	7	G.B. Mottesi
950920.1	*Nocomis leptocephalus*	Bluehead chub	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	3	G.B. Mottesi
950920.1	*Micropterus salmoides*	Largemouth bass	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	1	G.B. Mottesi
950920.1	*Hypentelium nigricans*	Northern hogsucker	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	1	G.B. Mottesi
950920.1	*Lepomis macrochirus*	Bluegill sunfish	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	2	G.B. Mottesi
950920.1	*Lepomis gibbosus*	Pumpkinseed sunfish	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	2	G.B. Mottesi
950920.1	*Lepomis cyanellus*	Green sunfish	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	5	G.B. Mottesi
950920.1	*Lythrurus ardens*	Rosefin shiner	Turkey Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	4	G.B. Mottesi
950920.2	*Luxilus albeolus*	White shiner	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	7	G.B. Mottesi
950920.2	*Nocomis leptocephalus*	Bluehead chub	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	7	G.B. Mottesi
950920.2	*Micropterus salmoides*	Largemouth bass	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	1	G.B. Mottesi
950920.2	*Lepomis cyanellus*	Green sunfish	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	5	G.B. Mottesi
950920.2	*Lepomis macrochirus*	Bluegill sunfish	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	3	G.B. Mottesi
950920.2	*Lepomis gibbosus*	Pumpkinseed sunfish	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	1	G.B. Mottesi
950920.2	*Etheostoma nigrum*	Johnny darter	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	27	G.B. Mottesi
950920.2	*Notropis procne*	Swallowtail shiner	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	12	G.B. Mottesi
950920.2	*Gambusia affinis*	Mosquitofish	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	14	G.B. Mottesi
950920.2	*Noturus insignis*	Margined madtom	Richland Creek	Ebenezer Church Road	Wake Co., NC	20 September 1995	1	G.B. Mottesi
950921.1	*Lepomis cyanellus*	Green sunfish	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	1	G.B. Mottesi
950921.1	*Percina roanoka*	Roanoke darter	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	5	G.B. Mottesi
950921.1	*Etheostoma nigrum*	Johnny darter	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	3	G.B. Mottesi
950921.1	*Luxilus albeolus*	White shiner	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	5	G.B. Mottesi
950921.1	*Notropis procne*	Swallowtail shiner	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	1	G.B. Mottesi
950921.1	*Nocomis leptocephalus*	Bluehead chub	Crabtree Creek	Edward Mill Road	Wake Co., NC	21 September 1995	7	G.B. Mottesi
950921.2	*Luxilus albeolus*	White shiner	Crabtree Creek	Duraleigh Road	Wake Co., NC	21 September 1995	3	G.B. Mottesi
950921.2	*Notropis procne*	Swallowtail shiner	Crabtree Creek	Duraleigh Road	Wake Co., NC	21 September 1995	2	G.B. Mottesi
950921.2	*Nocomis leptocephalus*	Bluehead chub	Crabtree Creek	Duraleigh Road	Wake Co., NC	21 September 1995	5	G.B. Mottesi
950921.2	*Etheostoma nigrum*	Johnny darter	Crabtree Creek	Duraleigh Road	Wake Co., NC	21 September 1995	2	G.B. Mottesi
950921.2	*Lepomis microlophus*	Redear sunfish	Crabtree Creek	Duraleigh Road	Wake Co., NC	21 September 1995	3	G.B. Mottesi
950921.2	*Lepomis auritus*	Redbreast sunfish	Crabtree Creek	Duraleigh Road	Wake Co., NC	21 September 1995	1	G.B. Mottesi
951003.1	*Lepomis auritus*	Redbreast sunfish	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	1	G.B. Mottesi
951003.1	*Lepomis cyanellus*	Green sunfish	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	2	G.B. Mottesi
951003.1	*Lepomis microlophus*	Redear sunfish	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	1	G.B. Mottesi
951003.1	*Hypentelium nigricans*	Northern hogsucker	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	1	G.B. Mottesi
951003.1	*Percina roanoka*	Roanoke darter	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	4	G.B. Mottesi
951003.1	*Etheostoma nigrum*	Johnny darter	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	8	G.B. Mottesi
951003.1	*Notropis procne*	Swallowtail shiner	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	9	G.B. Mottesi
951003.1	*Nocomis leptocephalus*	Bluehead chub	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	13	G.B. Mottesi
951003.1	*Luxilus albeolus*	White shiner	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	4	G.B. Mottesi
951003.1	*Cyprinella analostana*	Satinfin shiner	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	3 October 1995	8	G.B. Mottesi

Table 2. Fish found in the Crabtree Creek Subbasin (cont.)

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
960429.1	*Etheostoma flabellare*	Fantail darter	Sycamore Creek	Umstead Park, near bike trail	Wake Co., NC	29 April 1996	2	G.B. Mottesi
960429.1	*Notropis procne*	Swallowtail shiner	Sycamore Creek	Umstead Park, near bike trail	Wake Co., NC	29 April 1996	2	G.B. Mottesi
960429.1	*Lepomis macrochirus*	Bluegill sunfish	Sycamore Creek	Umstead Park, near bike trail	Wake Co., NC	29 April 1996	4	G.B. Mottesi
960429.1	*Lepomis gibbosus*	Pumpkinseed sunfish	Sycamore Creek	Umstead Park, near bike trail	Wake Co., NC	29 April 1996	3	G.B. Mottesi
960429.1	*Etheostoma nigrum*	Johnny darter	Sycamore Creek	Umstead Park, near bike trail	Wake Co., NC	29 April 1996	2	G.B. Mottesi
960604.2	*Anguilla rostrata*	American eel	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	4 June 1996	1	G.B. Mottesi
960604.2	*Cyprinella analostona*	Satinfin shiner	Crabtree Creek	Umstead State Park near Reedy Cr. Lake	Wake Co., NC	4 June 1996	3	G.B. Mottesi

Permitted Point Sources of Pollution

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NC Wildlife Resources Commission

Numerous permitted point sources of pollution occur within the Crabtree Creek Subbasin (Fig. 1). The point sources shown are those that applied and acquired a permit, but they are not all in use at this time. This information was acquired from the Water Quality Section, Division of Environmental Management, North Carolina Department of Environment, Health, and Natural Resources.

CRABTREE CREEK SUBBASIN

PERMITTED POINT SOURCES OF POLLUTION

31

> 1.0 MGD

BET. 0.051 & 1.0 MGD

BET. 0.011& 0.050 MGD

<=0.010 MGD

VARIABLE

Figure 1.

Miles

0 2 4

NC DENR Library 919-715-4161
3 1610 00001922 3